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Observations on Kala-Azar
in Kassala Province.

pp - 107 - 119.

THIRD REPORT

OF THE

WELLCOME RESEARCH LABORATORIES

AT THE

GORDON MEMORIAL COLLEGE

KHARTOUM

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OBSERVATIONS ON KALA-AZAR IN KASSALA PROVINCE

BY

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Since August, 1907, eight cases of this disease have been definitely diagnosed in the province, and all have terminated fatally, while thirteen other cases, extremely suspicious, have come under my observation or to my knowledge, of whom nine are already dead.

It is almost impossible to give any trustworthy idea of the prevalence of the disease, as the towns and villages are far distant one from another, usually being visited but once a year by a doctor, and then only for a day or two. Number of cases

Thus cases positively diagnosed have only been found at Kassala (7) and Mafaza (1), and prolonged observations on cases have only been carried out at Kassala and Gedaref, namely, where doctors were present.

However, the positive diagnosis of eight cases presents a serious picture when one remembers the fact that for every native admitted there are five or more who do not seek medical assistance.

It is a matter of extreme difficulty to trace the history and movements of the patients. Indeed, in some cases it is almost hopeless, for many have no fixed abode, are often admitted very ill, have no friends to speak for them, and, further, talk in various dialects. Thus of all the cases it has only been possible to find out definite abodes and house contacts in six out of a total of twenty-one, and even in these six cases sometimes the residence in a tukl (hut) or hosh (compound) was only for a few weeks.

Of the co-inhabitants I have had an opportunity of examining, I have found none suffering from the disease or presenting signs of ill-health suggestive of kala-azar, and in the few instances where I have been able to search the dwellings I have been unable to find bed-bugs.

However, I believe bed-bugs exist in every town and village of Kassala, and, personally, know of their existence in Kassala, Gedaref, Gallabat, Mafaza, Tomat, Sofi, and Turkelein. Specimens from the first three towns were sent to Dr. Balfour for examination, and Mr. H. King has identified them as *Cimex lectularius*. Bed-bugs in Kassala Province

Dogs are very common everywhere, but, unfortunately, this possible source of infection was not studied, since the observations on the liability of dogs¹ transmitting the disease were not then known to me.

To study the disease properly in this province, one specially appointed is required, who has all his time at his command for making lengthy observations and carrying out the difficult but important work of tracing these cases to their source in the various places.

The disease is apparently new or but recently recognised, for following Dr. Neave's case in 1904, the next one observed was by Captain Cummins in May, 1907, and in this province, though a case was suspected early in June, 1907, it was not until the third splenic puncture (August 30th) that Leishman-Donovan parasites were found, and since that date seven other cases have been definitely diagnosed. Historical

The very great importance of recognising the appearance of this disease in a new country is such that I append two tables, "A" of those cases definitely diagnosed by the discovery of the parasites, and "B" of those extremely suspicious of kala-azar, but where the parasites were not found.

¹ Nicolle, C., *La Semaine Médicale*, March 11th, 1908, and MM. Ch. Nicolle et Ch. Comte, *La Semaine Médicale*, April 22nd, 1908.

TABLE A. KALA-AZAR. (Parasite Found)

	Case I	Case II	Case III	Case IV
AGE AND SEX ...	♂ 23	♂ 25	♂ 25	♂ 26
NATIONALITY...	Abyssinian	Egyptian	Abyssinian	Arab, Maria Tribe
DURATION OF ILLNESS	2 years, Autumn, '05. Died Nov. 6th, '07	3½ months, Oct., '07. Died Feb. 4th, '08	2½ years, Autumn, '05 Died Dec. 22nd, '07	8 months, Aug., '07. Died Mar. 24th, '08
VILLAGES AND TOWNS WHERE ILL (Name underlined where first ill)	Addayagi (Erithrea), Kassala, Golsa, Kassala, Debelweit, Kassala	<u>Kassala</u>	<u>Azzein</u> (Erithrea), Karkabel, Glodet, Kassala	<u>Mafaza</u>
TYPE OF FEVER ...	Temperature usually sub-normal. Occa- sional rises to 101° to 105° for 1 to 2 days	High fever 4 weeks, then 98° to 99° for 5 weeks — then higher fever, seldom coming to normal	Intermittent fever, followed by normal	High intermittent fever
TYPE OF PARASITES (Splenic Puncture)	Considerable num- bers, mainly free. Long oval forms mainly	Few well-developed parasites	Well developed, none found in cells	Extremely few found. Pigment collection
PERIPHERAL BLOOD...	No malaria. No Leucocytosis. No parasites in white cells	No malaria. Leuco- pænia. No para- sites in white cells	No malaria, Leuco- pænia, almost all mononuclears	No malaria. Leucopænia
LIVER ...	Not enlarged, ap- parently reduced in size	Enlarged. Two fingers' breadth be- low costal margin	Not enlarged	Enlarged 1½ inch below costal margin
SPLEEN ...	1 inch below um- bilicus	1 inch below costal margin	1 inch below um- bilicus. Tender	2 inches below costal margin
URINE...	Albumen Bile absent	Albumen absent Bile absent	Albumen trace Bile	Albumen Bile
COMPLICATIONS ..	Diarrhoea. No pain	Pseudo - diphtheritic tonsillitis. Duodenal ulcers, with epi- gastric pain	Very collapsed. Died 5 days after ad- mission. No pain	Pains in shin bones. Epistaxis
JAUNDICE ...	Absent. Conjunctivæ, yellow	Absent. Conjunctivæ, yellow	—	—
EDEMA ...	Feet (terminal)	Absent	Feet (terminal)	Legs (terminal)
TREATMENT ...	Quinine no effect. Heavy and in- creasing doses of HgCl ₂ useless	Quinine apparently beneficial at first. Later Atoxyl and HgCl ₂ injections to- gether with Fuch- sine pills	Admitted Aug. 14th, 1907, with fever. 30 grs. and injec- tions of quinine given. Temperature normal after 8 days and patient dis- charged well. Re- admitted Dec. 18th, 1907	Quinine had no effect. Atoxyl and sub- limate injections to- gether with Fuch- sine pills
PERIODS OF IMPROVEMENT	Yes	Yes	Yes, very marked	Yes
PIGMENTATION ..	None	None	None	None
HOUSE INFECTION HISTORY	Single. All living in hosh well. No bugs found	Single. Other soldiers healthy, but much malaria. No bugs	Single. No definite abode	Single. Case V. lived in police lines. Bugs denied

TABLE A. KALA-AZAR (Parasite Found)—*continued*

	Case V	Case VI	Case VII	Case VIII
AGE AND SEX ...	♂ 22	♂ 9	♂ 30	♂ 28
NATIONALITY ...	Abyssinian	Arab	Sudanese	Sudanese
DURATION OF ILLNESS	6 months, Oct., '07. Died April 8th, '08	4½ months, Dec., '07. Died April 29th, '08	4 months (?) Autumn, '07. Died Jan. 25th, '08	7½ months, Oct., '07. Died May 14th, '08
VILLAGES AND TOWNS WHERE ILL (Name underlined where first ill)	<u>Mafaza</u>	<u>Kassala</u>	<u>Gharb el Gash</u> (a Kassala suburb)	Khatmia (a Kassala suburb), Debeleweit
TYPE OF FEVER ...	Seen but once. History of con- tinuous fever	Perpetual high re- mittent, 104° to 101°	Intermittent, sub- normal, last 2 weeks	Intermittent, fre- quent intervals of 2 to 3 days. Normal temperature
TYPE OF PARASITES (Splenic Puncture)	Large number of big parasites	Many small parasites; very many blood platelets	Only one typical parasite found	Considerable num- bers of round and oval forms. Pig- ment collections
PERIPHERAL BLOOD...	No examination	No malaria. Leuco- pænia	No malaria	No malaria
LIVER ...	Slightly enlarged	Enlarged 3 inches below costal margin	Slightly enlarged	Enlarged. Hand's breadth below costal margin
SPLEEN ...	2 inches below um- bilicus	1 inch below costal margin	Considerably enlarged	1 inch below um- bilicus
URINE...	—	Albumen absent Bile absent at first, later present	No albumen No bile	Albumen Bile
COMPLICATIONS ...	No pain. No com- plications when seen. Constipation	No pain	No pain	No pain. Persistent terminal epistaxis
JAUNDICE ...	Absent. Conjunctivæ, yellow	Absent	Absent	Conjunctivæ, yellow
CEDEMA ...	Absent when seen	General œdema marked	Not noted	Legs (terminal)
TREATMENT ...	No improvement on quinine, 15 grs. daily	Quinine, 40 grs. daily, no effect	Quinine, no effect	Quinine 40 to 60 grs. daily, slight im- provement. Thymol 6 grs. daily, no effect
PERIODS OF IMPROVEMENT	Unknown	No	Unknown	Yes
PIGMENTATION ...	None	None	None	None
HOUSE INFECTION HISTORY	Single. Brother and brother's wife with whom living, well	Mother and two young sisters healthy. No bugs found	No definite abode	No definite abode

TABLE B—SUSPICIOUS KALA-AZAR CASES

	Case I ♂ 35	Case II ♀ 11	Case III ♂ 6	Case IV ♂ 26	Case V ♂ 22	Case VI ♀
AGE AND SEX						
NATIONALITY	Sudanese	Abyssinian	Abyssinian	Egyptian		
VILLAGES AND TOWNS WHERE ILL	<i>Gharb-el-Gash</i> (a Kassala suburb)	<i>Gallabat</i>	(?) <i>Gallabat</i>	<i>Mafaza</i> , Geili	<i>Mafaza</i>	<i>Mafaza</i>
DURATION OF ILLNESS	No history. Admitted moribund. Removed by friends. Died outside	2 years. Seen only once	1½ years. Seen but once	Six months, August, 1907. Died Feb. 1908	Fivemonths, Aug., 1907. Died Dec. 12th, 1907	Several mos. Died Dec. 27th, 1907
TYPE OF FEVER	(?) Subnormal 36 hours	99° when seen	No fever when seen	Periods of fever 100° to 102°, alternating with periods of normal	Continuous, remittent, 100°-103°	Fever present, type unrecorded
BLOOD EXAMINATION	Not examined	Spleen puncture. No malaria, no kala-azar. Many blood platelets	Peripheral blood. No malaria. Leucopenia	Peripheral blood. No malaria. Leucopenia	—	—
HOUSE INFECTION HISTORY	Unknown	Motherwell, baby brother enormous spleen, but well nourished	Unknown	{ Case IV, an Egyptian official; Case V, his male servant; Case VI, his female servant—all from one compound. All died within three months of one another		
LIVER	... { Considerably enlarged	Enlarged	Much enlarged	Not enlarged	Enlarged	Not enlarged
SPLEEN	... { Considerably enlarged	Considerably enlarged	Much enlarged	Enlarged	Considerably enlarged	Not enlarged
CONDITION AND COMPLICATIONS	Very weak and wasted. Conjunctivæ, yellow	Marked wasting and weakness. Conjunctivæ, yellow	Very weak and emaciated	Emaciation and weakness marked. Slight jaundice, cedema of legs (terminal)	Progressive weakness & wasting. Dysentery, last 7 days	General cedema at the end. Comatose, last 2 days
TREATMENT	—	—	—	Temporary improvement under quinine, but steady emaciation	Quinine, no effect	Quinine, no effect

	Case VII ♂ 25	Case VIII ♂ 23	Case IX ♂	Case X ♂	Case XI ♂ 22	Case XII ♂	Case XIII ♂ 22
AGE AND SEX							
NATIONALITY	Egyptian	Arab	Arab		Arab	Arab	Abyssinian
VILLAGES AND TOWNS WHERE ILL	<i>Umbrega</i> (Abyssinian frontier)	<i>Gallabat</i>	<i>Mafaza</i>	<i>Gallabat</i>	<i>Gallabat</i>	<i>Mafaza</i>	<i>Kassala</i>
DURATION OF ILLNESS	Several months (?) living	Several mos. Died 21st May, 1908	Several mos. Died 8th Oct., 1907	Several mos. Died 16th Dec., 1907	Several mos. Died 19th Dec., 1907	4 months. Still living	2½ years. Died 10th April, 1908
TYPE OF FEVER	Periodic waves	Continuous fever, 100° to 102°	Continuous fever, 100° to 103°	Continuous fever, 99° to 101°	Continuous fever, 100° to 103°, 104°	Continuous, 99°-normal or subnormal	Periodic attacks, continuous last 2 weeks
BLOOD EXAMINATION	Spleen punctures, no malaria, no kala-azar	Spleen punctures, no malaria, no kala-azar	—	—	—	Spleen puncture, no malaria, no kala-azar	Spleen puncture, no malaria, no kala-azar
HOUSE INFECTION HISTORY	—	—	—	—	—	—	No definite abode
LIVER	... { Enlarged	Not enlarged	Not enlarged	Enlarged	Enlarged	Much enlarged	Not enlarged
SPLEEN	... { Much enlarged	Enlarged	Much enlarged	Greatly enlarged	Enlarged	Much enlarged	—
CONDITION AND COMPLICATIONS	Progressive wasting and weakness, conjunctivæ, yellow	Extreme emaciation and weakness, conjunctivæ, markedly yellow	Continuous hæmorrhage from gums and nose	Emaciation and weakness marked	Pigmented patches in many places, last 2 days diarrhoea and vomiting	Very emaciated	Very wasted and weak. Pain in bones of legs. (Edema of legs last 7 days
TREATMENT	Fever lessened by heavy doses of quinine—but progressive emaciation	Quinine, no effect	Quinine, no effect	Quinine, no effect	Quinine, no effect	Quinine, no effect	Quinine, grs. 40-60, no effect
POST MORTEM EXAMINATIONS	—	—	—	{ Spleen and liver enlarged, no other condition found		—	—

Most of the cases in Table "B" refused to react to heavy and continued doses of quinine, and other conditions, such as tubercle, malaria, abscess of liver, and spleno-medullary leucocythemia, were usually excluded; malignant disease is practically out of court owing to its extreme rarity in this Province. In all cases, when spleen puncture was performed, examination of peripheral blood was also made.

Unfortunately it must be said "usually excluded" for it must be noted that some cases were seen but once, and others were seen by a medical officer who had no microscope and was unfamiliar with kala-azar.

These tables give summaries of the cases, and they have been included, as it was thought that they might be useful in following up in the future this disease in the province.

Five are included in Table "B," whose splenic blood was examined with negative results, but this is done because, in my small experience, it is extremely hard in many cases to find the parasites.

In the first case it was not till the third splenic puncture that parasites were seen, and in several others the results from the first and second punctures were negative. Often only one film out of four or five would present parasites, and even then in very small numbers. The average time spent for microscopic diagnosis has certainly worked out at nearly four hours each case; in only three cases were parasites found in the first films examined.

TYPES OF PARASITES OBSERVED. In all cases, except two, only free forms were found. It was noteworthy that in all cases the free forms seemed to be about the same stage of development, smaller and younger forms were seldom observed. Types of parasites

In cases I., III., IV. and VI., practically all the parasites were of an elongated, almost torpedo shape, while in cases II., V. and VIII., nearly all were large and oval.

Case VI. presented many small parasites, and the splenic blood was remarkable from the enormous number of blood platelets it contained; this was the only juvenile case of the series.

In case VII. only one absolutely typical Leishman-Donovan body was found in six slides examined.

In none of the spleen smears from those of Table "A" were malarial parasites found, and in only two were collections of pigment noted; this is probably accounted for by the fact that the patients were drenched with quinine prior to the examination. Peripheral blood examinations never exhibited parasites, either free or in leucocytes.

In none were malarial parasites found, and in none were any marked changes observed, except those of anæmia.

In four of the positive cases there was marked leucopænia, and in one case nearly all the white cells were mononuclear leucocytes. In four cases the blood was very "watery," and spread on the slides extremely badly.

Spleen puncture was carried out by a small, long hypodermic needle and "all-glass" syringe, under strict aseptic precautions, and though some sixty odd splenic punctures have been performed, in many cases on very anæmic subjects, yet in no case has any bad result followed. Splenic puncture

One case had pain over the site of puncture for twenty-four hours, and another, whose temperature was 100° previously, had a rise to 105° on the evening following the puncture, but the temperature fell again to 100° on the following day.

The Source of Infection is unknown, and apparently these cases are sporadic.

The only instance of house infection occurred at Mafaza, and in these cases no positive diagnosis was made, though personally I have no doubt they were kala-azar, and had their tukls and compound burnt down. House infection

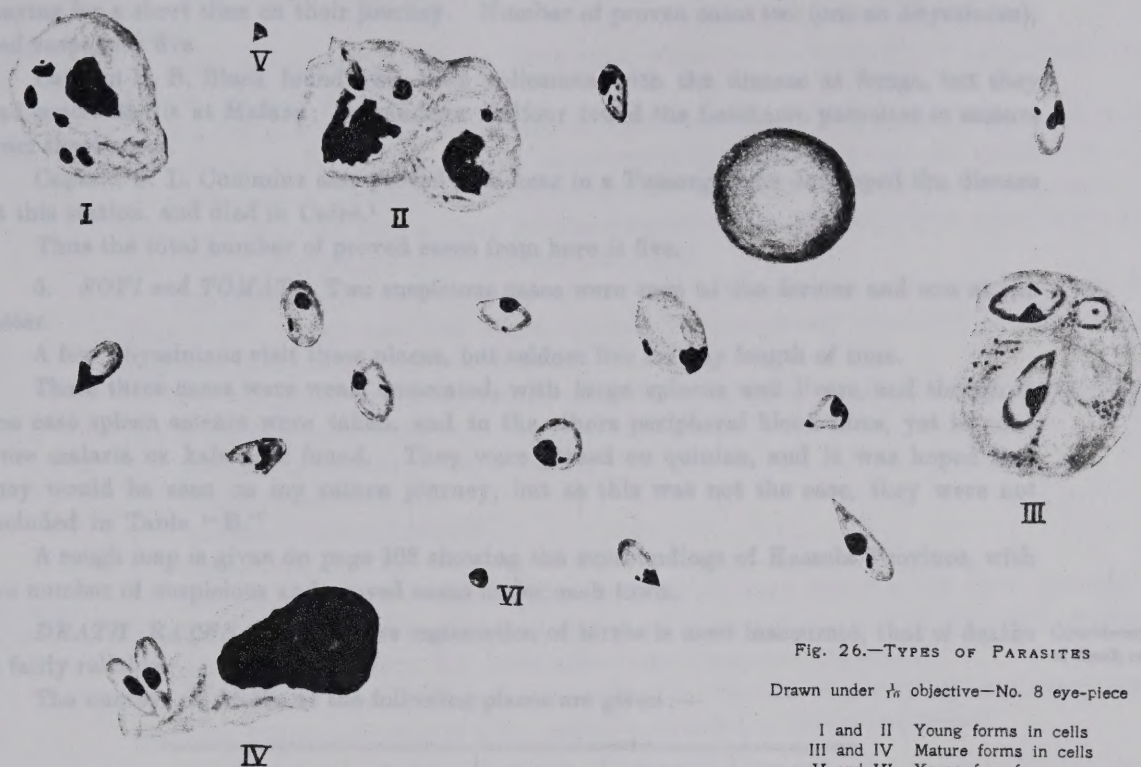


Fig. 26.—TYPES OF PARASITES

Drawn under $\frac{1}{16}$ objective—No. 8 eye-piece

- I and II Young forms in cells
 III and IV Mature forms in cells
 V and VI Young free forms

From original coloured drawing by L. BOUSFIELD

I only saw the Egyptian official on two occasions at Gedaref, and his peripheral blood showed no malaria, but marked leucopænia; splenic puncture was absolutely refused.

These cases are IV., V. and VI. in Table "B," and it is to be noted that the master and male servant became ill in August, 1907 (however a malarial period), the female servant a little later. The male servant died on December 25th, 1907, the female servant on December 27th, 1907, and the master in February, 1908; the summaries of their histories are given in the Table.

Is Abyssinia
to blame?

The possibility of the introduction of the disease by Abyssinians has been enquired into, and it certainly is striking that out of the eight positive cases, three were Abyssinians (37·5 per cent.), and of the thirteen suspicious cases three were of this nationality. Considering their comparatively small number it is a suggestive fact.

I inspected all the Abyssinian men who could be collected at Gedaref, but found all healthy, except one suffering from malaria.

These facts were ascertained about the following towns:—

Analysis
of cases

1. **KASSALA.** Many Abyssinians live here, and the number of local cases are four proved, two suspicious—all fatal.

2. **GALLABAT** is constantly full of Abyssinians. Five suspicious cases, three already fatal. I also saw many children with enormous spleens, but malaria is rampant here during and after the rains.

3. **GEDAREEF.** Comparatively few Abyssinians; the Mamour being able to collect only thirteen men for my examination. No known cases.

4. *MAFAZA*. But few Abyssinians live here, though a fair number pass through, staying for a short time on their journey. Number of proven cases two (one an Abyssinian), and suspicious five.

Captain R. B. Black found two Arab policemen with the disease at Senga, but they had contracted it at Mafaza; Dr. Andrew Balfour found the Leishman parasites in smears from these cases.

Captain S. L. Cummins also proved kala-azar in a Tumergi, who developed the disease at this station, and died in Cairo.¹

Thus the total number of proved cases from here is five.

5. *SOFI and TOMAT*. Two suspicious cases were seen at the former and one at the latter.

A few Abyssinians visit these places, but seldom live for any length of time.

These three cases were weak, emaciated, with large spleens and livers, and though in one case spleen smears were taken, and in the others peripheral blood films, yet in none were malaria or kala-azar found. They were placed on quinine, and it was hoped that they would be seen on my return journey, but as this was not the case, they were not included in Table "B."

A rough map is given on page 103 showing the surroundings of Kassala Province, with the number of suspicious and proved cases under each town.

DEATH RATES. Though the registration of births is most inaccurate, that of deaths is fairly reliable. Consideration of death rates

The number of deaths at the following places are given:—

Year	Kassala	Gedaref	Gallabat	Mafaza
1906	183	311	26	53
1907	299	254	137	104
1908 (to end of April)	48	51	32	36
—	144	153	96	108

The last row shows the number of deaths in 1908, if the same rate were maintained during the remaining months of the year; but this is quite unreliable, since the deaths appear usually greater during the last four months than during the first and middle four.

Further, these populations vary very greatly, and so statistics are very unreliable. However, the death rate at Mafaza seems to be steadily increasing.

DURATION OF ILLNESS. The average duration of the positive cases was apparently 10.5 months, the longest being 2½ years, and the shortest 3½ months. Duration of illness

The *incidence* of the disease seems to be from August to December, *i.e.* during and subsequent to the rainy and cool weather. Three definitely dated the beginning of their illnesses to August, one to September, and three to October.

This probably corresponds with a temperature below 75° F., anyhow during the night hours, and so falls in with Rogers' statement² that the parasites develop best at a temperature below 75° F.

¹ Cummins, S. L., February, 1903, "Kala-azar in the Anglo-Egyptian Sudan." *Journal of the Royal Army Medical Corps*.

² Rogers, Leonard, I.M.S., 1907 Milroy Lecture. Lecture II.

CLINICAL FEATURES. In all, marked weakness and general emaciation were very evident.

Pain was absent, except in three cases where it was insignificant (one splenic pain, and two pains in tibiae).

Signs and
symptoms

All the positive cases showed splenic enlargements, six to a marked degree, while five showed the liver increased in size, three markedly. In four cases the conjunctivæ were noticeably yellow without bile being present in the urine, while three were jaundiced. In four cases albumen, from a trace to large quantities, was present, and in all cases the urine was of low specific gravity, the average being 1012.

Pigmentation of the skin was not seen in any case, but was present in Case XI., Table "B." In all cases the tongue remained comparatively clear, and the appetite and digestion good, except just before death.

The complications noted were:—Pseudo-diphtheritic tonsillitis and epigastric pain due to duodenal ulcers (1).

Terminal persistent epistaxis (2).

Terminal diarrhoea (2).

Edema of feet and legs (4).

General œdema (1).

Significance
of œdema

In all cases where œdema appeared, death occurred within a few days, although the patient's general condition seemed no worse than before, and in my short experience the appearance of œdema is a premonitory sign of approaching death.

In no cases was ascites encountered, and in the case of general œdema there was no albumen, and the quantity of urine passed in twenty-four hours was normal.

DIAGNOSIS. This appears to be of considerable difficulty, owing to the prevalence of malaria.

Diagnosis

The main points noted in these cases were progressive emaciation and weakness; enlargement of liver and spleen; absence of pain; albumen and bile in the urine; and refusal to react to quinine.

Differential
diagnosis

My experience is that malaria met with in this province (malignant tertian I believe to be very rare) seldom leads to liver enlargement, and if due to this cause the patient rapidly improves on quinine; and I am of opinion that every case with liver enlarged, together with the spleen, should be looked upon with the gravest suspicion, provided that local conditions can be excluded.

A positive spleen puncture settles the diagnosis, but a negative result is useless, for the parasites are so few, and so may easily be missed or be absent. Major Rogers, I understand, now considers spleen puncture unnecessary for diagnosis, but the risks are so small that this, together with the impossibility of finding the parasite peripherally, seems to me to justify this procedure.

The presence of albumen in the urine is important, for in the severer cases of 2,000 odd malaria patients last autumn albumen was never found except where something else was present to account for it, such as bilharziosis.

The yellow coloration of the conjunctivæ is helpful, but natives, especially Sudanese, often have a naturally yellowish tinge to their conjunctivæ.

Malta fever
a difficulty

The presence of Malta fever enhances the difficulty, especially as the essentials for serum diagnosis are wanting in Kassala.

A difficult example was Case III., Table A, who was admitted to hospital on August 14th, 1907, with fever 102°, a spleen enlarged one inch below the costal margin, and no noticeable enlargement of the liver.

He was given quinine by injections and by the mouth; the fever lasted only eight days, and he was discharged comparatively well after eighteen days with a diagnosis of malaria. The spleen had considerably decreased in size.

He was not seen again till he was brought to hospital very collapsed on December 18th, 1907. His spleen was enlarged to one inch below the umbilicus, but there was no obvious liver enlargement. He had high intermittent fever for three days, sub-normal two days, and death occurred on December 22nd, 1907. Typical parasites were found in the spleen blood on December 19th, 1907.

Probably he was suffering from kala-azar when first admitted in August, and was unwittingly discharged wrongly diagnosed, possibly to be a source of infection to his neighbours during the following three months.

TREATMENT EMPLOYED. Many were treated with prolonged large doses (30–50 grains daily) of quinine, or by hypodermic injections (10–18 grains). Temporary improvement occurred in several cases, but as others similarly improved, not on quinine, it is doubtful if it is due to this drug. Treatment

One was treated with thymol 6 grains daily, but with no beneficial result.

Two were treated with intramuscular injections of atoxyl and corrosive sublimate alternately, combined with fuchsin pills¹; charts and notes of these cases are given. All the cases were advanced, and so probably this treatment did not have a fair chance.

NOTES ON CASE II

S. S. A WAKIL OMBASHI, MEDICAL CORPS

Notes on
cases

PREVIOUS HISTORY. No serious previous illness.

Arrived Kassala Province May 16th, 1906.

In 1906 proceeded to Gedaref for three days and then returned to Kassala.

On April 23rd, 1907, proceeded with S. M. O. on his inspection tour, and spent three days at Gedaref, three days at Gallabat, and three days at Mafaza, where he slept on an angareeb with the resident Medical Corps Tumergi, who has since gone on leave in good health.

He was sure he was not bitten by bed-bugs at Mafaza.

Proceeded on leave on June 15th, 1907, to Nazlet Ali Pasha, Benisuef Mudiria, Upper Egypt.

Good health on leave and returned healthy to Kassala, August 14th, 1907.

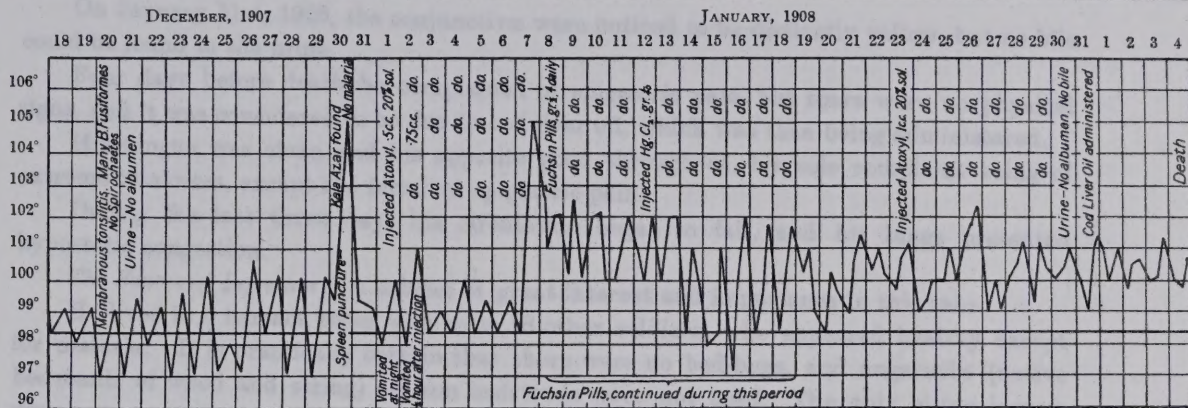
There was a very severe outbreak of malaria, and he was admitted to hospital October 12th, 1907, till October 21st, 1907, with malaria (?)—his spleen was enlarged to the costal margin. He was re-admitted on October 30th, 1907, and his temperature chart gives his pyrexia till the day of death.

No malaria was found in his blood, but it was quite the exception (7 per cent. positive) to find parasites, owing to all taking prophylactic doses of quinine regularly.

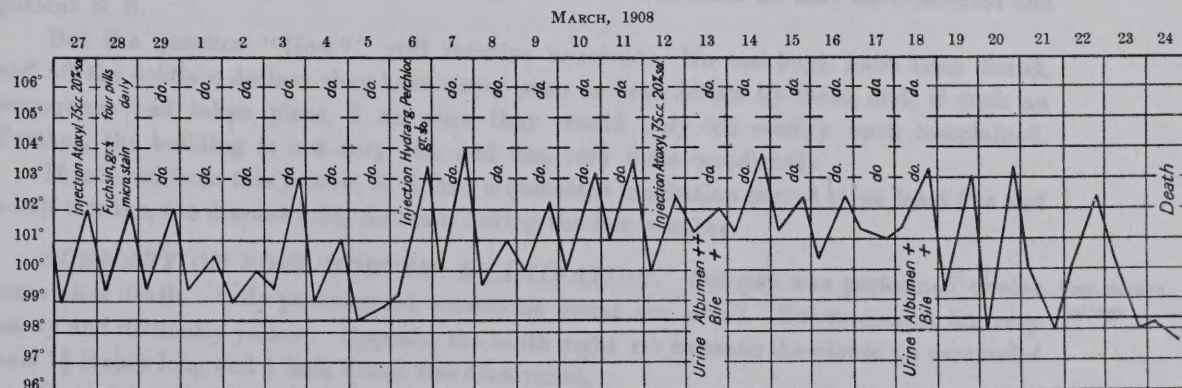
At first quinine by mouth and by injection seemed to have a beneficial result, but weakness and emaciation progressed steadily; his spleen continued to enlarge; his liver was distinctly increased in size, and kala-azar was suspected and spleen puncture proved positive on December 30th, 1907.

On December 19th, 1907, he had an attack of pseudo-diphtheritic tonsillitis, due to *Bacilli fusiformes*—no spirochaetes were found, and there was no albumen in the urine. He was then placed on atoxyl-fuchsin-sublimate treatment (see Chart, page 116).

¹ Dosage, etc., as suggested by A. Nierenstein for Trypanosomiasis. *British Medical Journal*, July 27th, 1907.



FEBRUARY, 1908																											
31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	



Case IV. IDRIS ADAM, A POLICEMAN FROM M'AFAZA, AGED ABOUT 26. KALA-AZAR

FIG. 27.—TEMPERATURE CHARTS

After the first atoxyl injection he vomited at night, which he had not done before.

Half an hour after the second injection he vomited again.

Otherwise he had no signs of any trouble from the arsenic; there was no gastritis, no diarrhoea, no pigmentation, no neuritis, and no ocular trouble.

The type of atoxyl used is unknown, but it was probably of English manufacture.

There was no medicinal fuchsin, so that used for microscopical purposes was employed, and this drug produced no ill effects.

On January 31st, 1908, the conjunctivæ were noticed to be distinctly yellow, but no bile could be found in the urine.

Four days before death he complained of epigastric pain, but there were no physical signs, and it was considered to be due to cod liver oil, which was then being administered.

His tongue was clean and his appetite good throughout, his sole complaint being of extreme weakness, except the terminal epigastric pain.

During the last three days his circulation began to fail, and his lungs presented hypostatic congestion.

The Source of Infection is a subject of great interest and importance in this case.

He lived in a barrack room with some 18 other soldiers, who appeared healthy except for malaria. It is practically certain that there were no bed-bugs, and angareeb (native bedsteads of wood and string) or iron bedsteads were not used. The only biting insects were ants or mosquitoes, mainly *Pyretophorus costalis*.

In May, 1906, he spent three days at Mafaza, but the man on whose angareeb he slept was quite healthy in March, 1906, when last seen.

He was quite well on leave, and I do not know if kala-azar exists at Nazlet Ali Pasha, but I find that a Tumergi (No. 1128) from Mafaza came to Kassala on December 3rd, 1906, and lived in the barrack-room with this man.

This Tumergi was admitted to hospital December 16th, 1906, and discharged December 19th, 1906, diagnosed as simple continuous fever. He was again admitted on March 23rd, 1907, as enteric fever and discharged April 21st, 1907.

Re-admitted on April 30th, 1907, as malaria, and remained in hospital till June 5th, 1907, when he was sent by sick convoy to Cairo, and there was definitely diagnosed as kala-azar by Captain Cummins.

Thus, during the periods he was living in the barrack-room he may have infected the patient S. S.

But the question "How?" still remains unsolved. No bed-bugs have been found, and all the soldiers declare they have never seen or been bitten by them, and, if such an occurrence had taken place, I am sure they would only too readily have complained. Further, the building is not very old, and has very little woodwork.

If infected from this source, S. S. had a quiescent incubation period of at least five and a-half months, the disease lying dormant during the hot weather.

SUMMARY OF POST MORTEM EXAMINATION. Autopsy was performed twelve hours after death. Only pathological conditions found are noted. Subcutaneous fat very scanty and distinctly yellow. Opposite the ninth right rib beneath the pleura an *encapsuled mass* $1\frac{1}{2}$ inches long and 1 inch broad was discovered. Post mortem findings

On cutting the capsule, soft, white, chalk-like material was found, like an old caseous gland; but if so, of very long-standing duration.

Right Pleural Cavity obliterated, except at apex, by a layer ($\frac{1}{4}$ to $\frac{1}{2}$ inch thick) of coagulated serum intersected by soft fibrous bands.

Lungs. No signs of tubercle, recent or old. Bases œdematous.

Aorta. Yellowish tinge, small raised patches (1 to 4 mm. long) beneath the internal coat.

Liver. Weight 5 lb. Much enlarged, slightly nutmeg. Marked fatty degeneration, especially noted in right lobe. No amyloid degeneration.

Spleen. Enlarged, weight 2 lb. 3 oz.; dark maroon; soft, but not diffuent. No sign of position of spleen puncture.

Stomach. Normal, but a large gland (?) 3 inches long, 1 inch broad, and $\frac{1}{4}$ inch thick beneath submucosa on lower border of anterior wall.

Parietal and Visceral Peritoneum showed many small sub-peritoneal hæmorrhages.

Duodenum. Two inches from the pylorus there were two small ulcers ($\frac{1}{4}$ inch by $\frac{1}{8}$ inch and $\frac{1}{4}$ inch by $\frac{1}{10}$ inch) with shelving edges, red bases, and apparently of not very acute formation.

The subjacent peritoneum was not thickened, and presented no tubercles. Probably the epigastric pain complained of four days before death was due to these ulcers.

Small Intestine. Marked congestion near the ileocæcal valve, with a few submucosal hæmorrhages.

Large Intestine. Intense congestion of cæcum and first eighteen inches of colon. Appendix normal.

Lymphatic Glands. These, draining the small intestine, were all greatly enlarged ($\frac{1}{2}$ inch to $1\frac{1}{4}$ inch long), of fleshy consistency, and deep maroon in colour.

Kidneys. Each weighed about 9 oz., and presented no morbid appearances.

Pancreas, ureters, bladder and prostate, healthy. Red marrow of bones, brain and spinal cord were not examined.

Many specimens were taken and sent to Dr. Andrew Balfour for examination.¹

Smears were taken from liver and spleen, some were sent to Dr. Andrew Balfour and some examined here; and certainly it is a very striking fact that although some twelve hours were spent in examining various smears, in no case could I find anything similar to a Leishman parasite. Further, Dr. Balfour could not find any, though one of the films sent was too thick for proper examination.

There is no doubt that the Leishman parasite was found in smears taken on December 30th, 1907, and Dr. Balfour verified this, his report being, "unmistakable Leishman-Donovan bodies present."

Thus the very important point arises—Did the application of the bio-chemical treatment free the patient from the parasites, though too late to prolong life and procure recovery?

NOTES ON CASE IV

IDRIS ADAM, AGED 26, ARAB POLICEMAN

HISTORY—

Sent to Mafaza, January, 1907.

Lived in police tukls.

Fever started in August, 1907, and then was constantly present except for intervals of five to seven days.

The medical orderly gave him daily quinine, 5–10 grains.

He was sent from Mafaza on January 20th, 1908, and on admission to Kassala Civil Hospital on February 1st, 1908, he was found very emaciated and weak and suffering from fever (*see* Chart, page 116).

¹ Unfortunately all the tissues were destroyed in the fire of May 11th.—A.B.

Liver and spleen were considerably enlarged, the conjunctivæ were yellow, and the urine contained bile and a trace of albumen.

The spleen decreased in size under quinine injections, but this drug had no effect on his temperature.

On February 4th, 1908, a spleen puncture was performed, but no parasites found.

On February 19th, 1908, a second splenic puncture was positive, typical "bodies" were found, but in very small numbers.

On February 22nd, 1908, he was started on the atoxyl-fuchsin-sublimate treatment, but though no untoward symptoms appeared, yet there was no improvement. Weakness and emaciation steadily increased, œdema of legs appeared on March 14th, 1908, troublesome and persistent epistaxis on March 22nd, 1908, and he died on March 26th, 1908.

An autopsy was not performed owing to the strong objections of his relations, so it was not possible to prove if the parasites had disappeared from spleen and liver.

It is greatly to be regretted that more autopsies were not performed, but the feeling is so strong against this procedure that it was considered unwise to insist, for undoubtedly by doing so very great harm would have been done to the civil work.



